PHYS 251
HW 7

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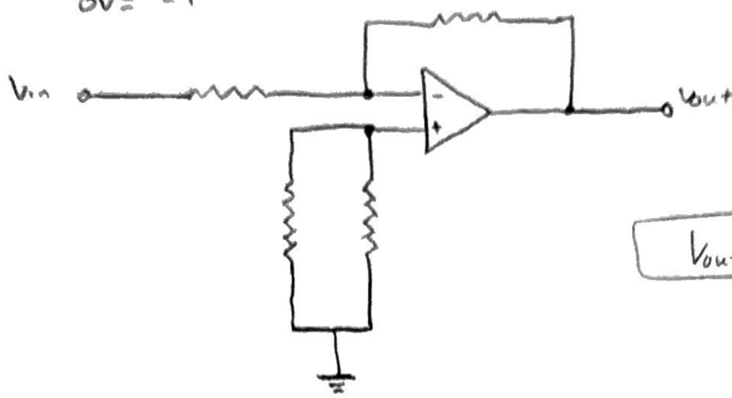
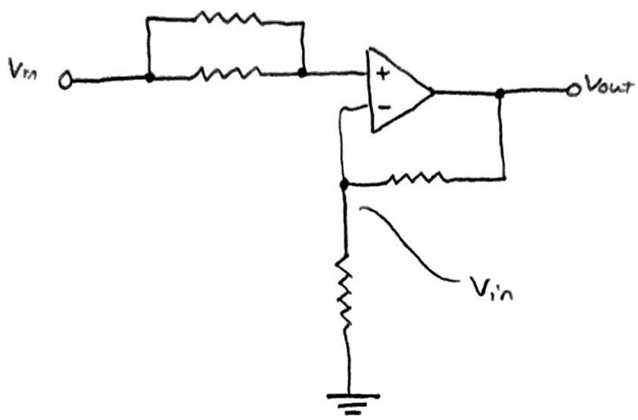
4.1

$G_v = -1$



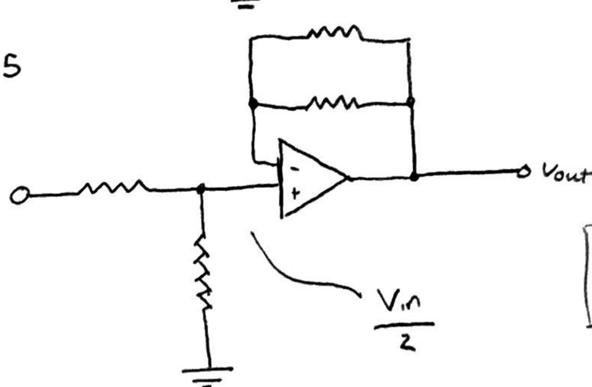
$V_{out} = -1$

$G_v = 2$



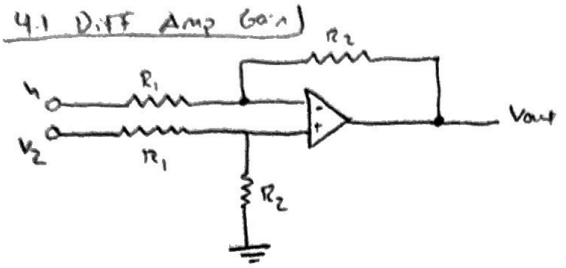
$V_{out} = 2V_{in}$

$G_v = 0.5$



$V_{out} = \frac{V_{in}}{2}$

4.1 Diff Amp Gain



$$V_{out} = \frac{R_2}{R_1}(V_2 - V_1)$$

$$V_+ = \frac{R_2}{R_1+R_2} V_2$$

$$V_1 - I R_1 = V_- = V_+ = \frac{R_2}{R_1+R_2} V_2$$

$$V_1 - \frac{R_2}{R_1+R_2} V_2 = I R_1$$

$$I = \frac{V_1}{R_1} - \frac{R_2 V_2}{R_1(R_1+R_2)}$$

$$V_1 - IR_1 - IR_2 = V_{out}$$

$$V_{out} = V_1 - V_1 + \frac{R_2}{R_1+R_2} V_2 - \frac{R_2}{R_1} V_1 + \frac{R_2^2 V_2}{R_1(R_1+R_2)}$$

$$= \frac{R_1 R_2 V_2}{R_1(R_1+R_2)} - \frac{R_2(R_1+R_2)V_1}{R_1(R_1+R_2)} + \frac{R_2^2 V_2}{R_1(R_1+R_2)}$$

$$= \frac{R_1 R_2 V_2 - R_1 R_2 V_1 - R_2^2 V_1 + R_2^2 V_2}{R_1(R_1+R_2)}$$

$$= \frac{R_2 V_2 (R_1+R_2) - R_2 V_1 (R_1+R_2)}{R_1(R_1+R_2)}$$

$$\boxed{V_{out} = \frac{R_2}{R_1}(V_2 - V_1)}$$